14 August 2000

CRUISE RESULTS
Fisheries Research Vessel Delaware II
Cruise No. DE 00-06
Ecosystems Monitoring Survey

CRUISE PERIOD AND AREA

The cruise period was from 22 May to 8 June 2000. The research vessel Delaware II covered the Mid-Atlantic Bight, Southern New England, Georges Bank and Gulf of Maine regions (Figure 1) as part of the Late Spring Survey Period.

OBJECTIVES

The objective of the cruise was to assess the impact of changing biological and physical properties of the Georges Bank and Gulf of Maine portions of the Northeast Continental Shelf ecosystem which influence the sustainable productivity of the living marine resources.

METHODS

The survey consisted of 120 randomly distributed stations at which the vessel stopped to lower instruments over the side.

Key parameters which were measured included water column temperature and salinity and at selected stations chlorophyll-a fluorescence, ichthyo and zooplankton composition, abundance and distribution; along-track temperature, salinity, chlorophyll-a fluorescence and standard weather observations.

A double oblique tow using the 61-centimeter Bongo sampler and a CTD was made at all stations and a CTD equipped with fluorometer at

stations in the Mid-Atlantic Bight, Southern New England and part of Georges Bank. The tow was made to approximately 5 meters above the bottom, or to a maximum depth of 200 meters, at a ship speed of 1.5 knots. Plankton sampling gear consisted of a 61-centimeter mouth diameter aluminum bongo frame with 2 333-micron nylon mesh nets. A 45-kilogram lead ball was attached by an 80 centimeter length of 3/8-inch diameter chain below the aluminum Bongo frame to depress the sampler. A digital flowmeter was suspended within the mouth of each sampler to determine the amount of water filtered by each net. The plankton sampling gear was deployed over the starboard quarter of the vessel by means of a conducting-cable winch and an A - frame. Plankton samples were preserved in a 5 percent solution of formalin in seawater. Tow depth was monitored in real time with a Seabird CTD profiler, which was hard-wired to the conductive towing cable, providing simultaneous depth, temperature and salinity data for each plankton tow and chlorophyll-a fluorescence data on stations in the Mid-Atlantic Bight, Southern New England and part of Georges Bank.

Continuous monitoring of the seawater temperature, salinity, and chlorophyll-a level, at a depth of 2 meters was done along all of the cruise track by means of a thermosalinograph, and a flow-through fluorometer.

The thermosalinograph and flow-through fluorometer were connected to the Scientific Computing System installed in the laboratory area of the vessel by Atlantic Marine Center personnel. This system recorded output from the thermosalinograph, and the fluorometer every ten seconds, and gave the data records a time-date stamp from the GPS unit.

Samples for Seabird salinity data calibration were obtained on the 6-12 watch by taking a water sample from 30 or more meters depth using a 1.7 liter Niskin bottle at every fifth or sixth station. Calibration of the thermosalinograph and fluorometer from the surface flow-through system was undertaken on the 12-6 watch following the protocol outlined in the Ecosystem Monitoring Program Operations Manual.

RESULTS

A summary of routine survey activities is presented in Table 1. A summary of special activities unique to this cruise is listed in the next section. Figure 1 shows the areal coverage achieved during the cruise. After a dockside test-cast using a new fluorometer-equipped CTD unit, the Delaware II sailed at 1500 EDT on May 22. Work commenced off the coast of New Jersey on the morning of May 23. The vessel proceeded south doing midshore and offshore stations in the Middle Atlantic Bight region, until reaching Cape Hatteras, then headed north along the inshore part of this region until reaching the Southern New England region on May 26. The Delaware worked this region from west to east. At 15 of the 30 stations a second haul was made to collect lobster larvae for Dr. Michael Chancy at URI, following the protocol listed in the Summary of Special Activities Section. Twenty six of the thirty Southern New England stations were completed before the vessel headed into Woods Hole on the evening of May 29 to exchange two members of the scientific party and to take on fuel. The Delaware sailed at noon, on the following day, May 30, 2000, to complete the remaining 4 Southern New England stations in the northeast corner of the region before proceeding on to Georges Bank. The Georges Bank region was reached on May 31, and was covered in a counter-clockwise manner, with the southern flank being sampled first, followed by the northeast peak, and then the shoal areas on the northwestern portion. The Georges Bank region was completed early in the morning of June 3. The Delaware then proceeded into the southwest corner of the Gulf of Maine, covering the stations in this region in a counter-clockwise manner. The good weather that had prevailed for almost the entire cruise, ended on June 6 when strong winds made it necessary to suspend operations. After diverting to assist a vessel in distress as listed in the Special Activities Section, the Delaware began jogging back to the next station position off the coast of New Hampshire where work was resumed late in the evening of June 7. Sampling at the last station of the cruise in Cape Cod Bay was completed in the early hours of June 8 and the vessel returned to Woods Hole via the Cape Cod Canal by 0800 that same morning.

The winch used to tow the Bongo sampler had a maximum payout rate of about 40 to 44 meters per minute. This is somewhat less than the standard specified in the Ecosystem Monitoring Operations Manual which is a rate of 50 meters per minute out at depths of 50 meters or more, but is a marked improvement over earlier cruises

using the same winch, where the maximum payout rate had only been 30 meters per minute. The improvement was due to the winch drum being full of wire (approximately 1000 meters) yielding a larger drum perimeter and consequently higher drum speed.

SUMMARY OF SPECIAL ACTIVITIES

- A CTD equipped with a fluorometer (unit # 2879) was used at the first 99 of 120 cruise stations until the unit failed while in the Georges Bank area. All subsequent stations were sampled using conventional CTD units. Samples for calibration of the Seabird CTD fluorometer were obtained on the 6-12 watch by taking a water sample using both a surface bucket and a 1.7 liter Niskin bottle from 30 or more meters depth at every fifth or sixth station.

- At 15 of the 30 Southern New England stations a second haul was made for Dr. Michael Clancy of the University of Rhode Island to delineate the occurrence of lobster larvae in inshore vs offshore areas of this region. These hauls were made with the same bongo equipment used for ecosystems monitoring, but they were done by yo-yo-ing the gear up and down to a depth of 10 meters 3 times within 15 minutes. These samples were then flash-frozen for subsequent DNA analysis ashore. Analysis of these special samples after the cruise by URI student Abigail Knee revealed a total of 12 lobster larvae found on two of the inshore stations near Block Island.

- At the Narragansett Laboratory, sample jars from stations in the Gulf of Maine were "eye-balled" for high volumes of Calanus finmarchicus by Brian Gervelis, a summer hire. Five stations were found to have high concentrations of this copepod. This information was forwarded to Pat Gerrior, the Northeast Region Right Whale Network Coordinator for use in directing overflights to locate pods of right whales. Two of the stations, in the vicinity of Cash's Ledge, were found to have right whales present.

- At 2215 on June 6 Ensign Kurt Dreflack picked up a Coast Guard Pan message regarding the fishing vessel Infinity, with 3 persons on board, taking on water during the storm. Captain Jack McAdam contacted Coast Guard Group Portland to confirm their position and to offer assistance. He then took the Delaware II at full speed through 10-12 foot seas and

northeast winds of 35-40 knots towards the sinking vessel which was southeast of Portland, Maine, 18 miles from our position. At the Coast Guard's request he diverted to a position 12 miles to the east of the stricken vessel's position to investigate an EPIRB signal. Before reaching this new position a survivor was pulled from the water by the Coast Guard at the original position. The survivor reported that the other two crewmen were in the water. The Delaware II then changed course back to the search and rescue scene, but when it was within two miles of the stricken vessel the Coast Guard had pulled the three-man crew from the water. Only one of them survived. Their vessel had sunk quickly, before the Coast Guard reached them and the survivor reported that the deceased crew members had not donned or had only partially donned their survival suits before entering the water. The Coast Guard released the Delaware II from the search and rescue operation at 0130 EDT on 7 June.

DISPOSITION OF SAMPLES AND DATA

All samples and data, except the CTD data, were delivered to the Ecosystems Monitoring Group of the NEFSC, Narragansett, RI, for quality control processing and further analysis. The CTD data was delivered to the Oceanography Branch of the NEFSC, Woods Hole, MA.

SCIENTIFIC PERSONNEL

National Marine Fisheries Service, NEFSC, Narragansett, RI

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Table 1. STATION OPERATION REPORT FOR CRUISE DE0006

STA	DATE	OPERATION	#SAMPLES	CTD CAST#	CTD FLUOR	OTHER SAMPLES
1	23-MAY-00	BONGO	2	1	Y	
2	23-MAY-00	WATER	1	2	Y	
2	23-MAY-00	BONGO	2	3	Y	
3	23-MAY-00	BONGO	2	4	Y	
4	23-MAY-00	BONGO	2	5	Y	
5	23-MAY-00	BONGO	2	6	Y	
6	23-MAY-00	WATER	1	7	Y	
6	23-MAY-00	BONGO	2	8	Y	
7	24-MAY-00	BONGO	2	9	Y	
8	24-MAY-00	WATER	1	10	Y	
9	24-MAY-00	BONGO	2	11	Y	
10	24-MAY-00	BONGO	2	12	Y	
11	24-MAY-00	WATER	1	13	Y	
11	24-MAY-00	BONGO	2	14	Y	
12	24-MAY-00	BONGO	2	15	Y	
13	24-MAY-00	BONGO	2	16	Y	
14	24-MAY-00	BONGO	2	17	Y	
15	24-MAY-00	WATER	1	18	Y	
15	24-MAY-00	WATER	1	19	Y	
16	25-MAY-00	BONGO	2	20	Y	
17	25-MAY-00	BONGO	2	21	Y	
18	25-MAY-00	BONGO	2	22	Y	
19	25-MAY-00	WATER	1	23	Y	
19	25-MAY-00	BONGO	2	24	Y	
20	25-MAY-00	BONGO	2	25	Y	
21	25-MAY-00	BONGO	2	26	Y	
22	25-MAY-00	BONGO	2	27	Y	
23	25-MAY-00	WATER	1	28	Y	
23	25-MAY-00	BONGO	2	29	Y	
24	26-MAY-00	BONGO	2	30	Y	
25	26-MAY-00	BONGO	2	31	Y	
26	26-MAY-00	BONGO	2	32	Y	
27	26-MAY-00	BONGO	2	33	Y	
28	26-MAY-00	WATER	1	34	Y	
28	26-MAY-00	BONGO	2	35	Y	
29	26-MAY-00	BONGO	2	36	Y	
30	26-MAY-00	BONGO	2	37	Y	
31	26-MAY-00	BONGO	2	38	Y	
31	26-MAY-00	BONGO	2	39	Y	Lobster Tow
32	26-MAY-00	BONGO	2	40	Y	
32	26-MAY-00	BONGO	2	41	Y	Lobster Tow
33	27-MAY-00	WATER	1	42	Y	
33	27-MAY-00	BONGO	2	43	Y	
33	27-MAY-00	BONGO	2	44	Y	Lobster Tow
34	27-MAY-00	BONGO	2	45	Y	
34	27-MAY-00	BONGO	2	46	Y	Lobster Tow
35	27-MAY-00	BONGO	2	47	Y	
35	27-MAY-00	BONGO	2	48	Y	Lobster Tow
36	27-MAY-00	WATER	1	49	Y	
36	27-MAY-00	BONGO	2	50	Y	
36	27-MAY-00	BONGO	2	51	Y	Lobster Tow
37	27-MAY-00	BONGO	2	52	Y	
38	27-MAY-00	BONGO	2	53	Y	

Table 1. (Continued) STATION OPERATION REPORT FOR CRUISE DE0006

STA	DATE	OPERATION	#SAMPLES	CTD CAST#	CTD FLUOR	OTHER SAMPLES
38	27-MAY-00	BONGO	2	54	Y	Lobster Tow
39	27-MAY-00	BONGO	2	55	Y	
40	27-MAY-00	BONGO	2	56	Y	
41	28-MAY-00	WATER	1	57	Y	
41	28-MAY-00	BONGO	2	58	Y	
42	28-MAY-00	BONGO	2	59	Y	
43	28-MAY-00	BONGO	2	60	Y	
44	28-MAY-00	BONGO	2	61	Y	
45	28-MAY-00	WATER	1	62	Y	
45	28-MAY-00	BONGO	2	63	Y	
45	28-MAY-00	BONGO	2	64	Y	Lobster Tow
46	28-MAY-00	BONGO	2	65	Y	
47	28-MAY-00	BONGO	2	66	Y	
47	28-MAY-00	WATER	1	67	Y	Lobster Tow
48	28-MAY-00	BONGO	2	68	Y	
48	28-MAY-00	BONGO	2	69	Y	Lobster Tow
49	29-MAY-00	WATER	1	70	Y	
49	29-MAY-00	BONGO	2	71	Y	
49	29-MAY-00	BONGO	2	72	Y	Lobster Tow
50	29-MAY-00	BONGO	2	73	Y	
50	29-MAY-00	BONGO	2	74	Y	Lobster Tow
51	29-MAY-00	BONGO	2	75	Y	
51	29-MAY-00	BONGO	2	76	Y	Lobster Tow
52	29-MAY-00	BONGO	2	77	Y	
53	29-MAY-00	WATER	1	78	Y	
53	29-MAY-00	BONGO	2	79	Y	
54	29-MAY-00	BONGO	2	80	Y	
55	29-MAY-00	BONGO	2	81	Y	
55	29-MAY-00	BONGO	2	82	Y	Lobster Tow
56	29-MAY-00	BONGO	2	83	Y	
56	29-MAY-00	BONGO	2	84	Y	Lobster Tow
57	30-MAY-00	BONGO	2	85	Y	
58	30-MAY-00	WATER	1	86	Y	
58	30-MAY-00	BONGO	2	87	Y	
59	31-MAY-00	BONGO	2	88	Y	
60	31-MAY-00	BONGO	2	89	Y	
61	31-MAY-00	BONGO	2	90	Y	
62	31-MAY-00	BONGO	2	91	Y	
62	31-MAY-00	BONGO	2	92	Y	
63	31-MAY-00	WATER	1	93	Y	
64	31-MAY-00	BONGO	2	94	Y	
65	31-MAY-00	BONGO	2	95	Y	
66	31-MAY-00	WATER	1	96	Y	
66	31-MAY-00	BONGO	2	97	Y	
67	1-JUN-00	BONGO	2	98	Y	
68	1-JUN-00	BONGO	2	99	Y	
69	1-JUN-00	BONGO	2	100	N	
70	1-JUN-00	WATER	1	101	N	
70	1-JUN-00	BONGO	2	102	N	
71	1-JUN-00	BONGO	2	103	N	
71	1-JUN-00	BONGO	2	104	N	
72	1-JUN-00	BONGO	2	105	N	
73	1-JUN-00	BONGO	2	106	N	
74	1-JUN-00	BONGO	2	107	N	

Table 1. (Continued) STATION OPERATION REPORT FOR CRUISE DE0006

STA	DATE	OPERATION	#SAMPLES	CTD CAST#	CTD FLUOR	OTHER SAMPLES
75	1-JUN-00	WATER	1	108	N	
75	1-JUN-00	BONGO	2	109	N	
76	2-JUN-00	BONGO	2	110	N	
77	2-JUN-00	BONGO	2	111	N	
78	2-JUN-00	BONGO	2	112	N	
79	2-JUN-00	BONGO	2	113	N	
80	2-JUN-00	BONGO	2	114	N	
81	2-JUN-00	WATER	1	115	N	
81	2-JUN-00	BONGO	2	116	N	
82	2-JUN-00	BONGO	2	117	N	
83	2-JUN-00	BONGO	2	118	N	
84	2-JUN-00	BONGO	2	119	N	
85	2-JUN-00	WATER	1	120	N	
85	2-JUN-00	BONGO	2	121	N	
86	3-JUN-00	BONGO	2	122	N	
87	3-JUN-00	BONGO	2	123	N	
88	3-JUN-00	BONGO	2	124	N	
89	3-JUN-00	BONGO	2	125	N	
90	3-JUN-00	BONGO	2	126	N	
91	3-JUN-00	WATER	1	127	N	
91	3-JUN-00	BONGO	2	128	N	
92	3-JUN-00	BONGO	2	129	N	
93	3-JUN-00	BONGO	2	130	N	Calanus OBSERVED
94	3-JUN-00	WATER	1	131	N	
94	3-JUN-00	BONGO	2	132	N	
95	4-JUN-00	BONGO	2	133	N	Calanus OBSERVED
96	4-JUN-00	BONGO	2	134	N	
97	4-JUN-00	WATER	1	135	N	
97	4-JUN-00	BONGO	2	136	N	
98	4-JUN-00	BONGO	2	137	N	
99	4-JUN-00	BONGO	2	138	N	Calanus OBSERVED
100	4-JUN-00	BONGO	2	139	N	
101	5-JUN-00	CTD	0	140	N	
101	5-JUN-00	CTD	0	141	N	
101	5-JUN-00	WATER	1	142	N	
101	5-JUN-00	CTD	0	143	N	
101	5-JUN-00	BONGO	2	144	N	
102	5-JUN-00	BONGO	2	145	N	
103	5-JUN-00	BONGO	2	146	N	
104	5-JUN-00	WATER	1	147	N	
104	5-JUN-00	BONGO	2	148	N	
105	5-JUN-00	BONGO	2	149	N	
106	5-JUN-00	BONGO	2	150	N	
107	5-JUN-00	BONGO	2	151	N	
108	5-JUN-00	WATER	1	152	N	
108	5-JUN-00	BONGO	2	153	N	
109	6-JUN-00	BONGO	2	154	N	
110	6-JUN-00	BONGO	2	155	N	
111	6-JUN-00	BONGO	2	156	N	
112	6-JUN-00	WATER	1	157	N	
112	6-JUN-00	BONGO	2	158	N	Calanus OBSERVED
113	6-JUN-00	BONGO	2	159	N	
114	6-JUN-00	BONGO	2	160	N	
115	6-JUN-00	BONGO	2	161	N	
116	7-JUN-00	BONGO	2	162	N	

Table 1. (Continued) STATION OPERATION REPORT FOR CRUISE DE0006

STA	DATE	OPERATION	#SAMPLES	CTD CAST#	CTD FLUOR	OTHER SAMPLES
117	7-JUN-00	CTD	0	163	N	
117	7-JUN-00	BONGO	2	164	N	Calanus OBSERVED
118	7-JUN-00	BONGO	2	165	N	
118	7-JUN-00	BONGO	2	166	N	
119	8-JUN-00	BONGO	2	167	N	
120	8-JUN-00	BONGO	2	168	N	

TOTALS: Bongo Casts = 120
Bongo Samples = 240
Water Samples = 28
CTD Casts = 168

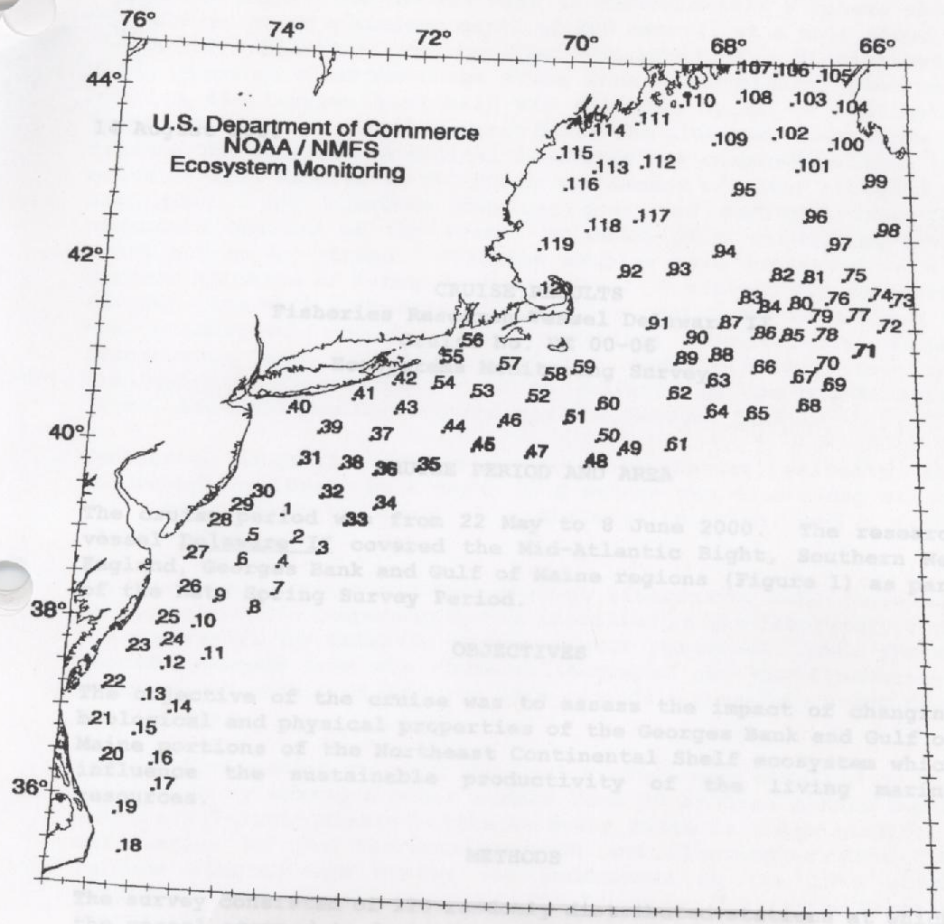

Figure 1. Station locations numbered consecutively for Late Spring Ecosystems Monitoring Cruise DE 00-06, 22 May - 8 June 2000.